

INFRARED EMISSION OF NORMAL GALAXIES FROM 3 TO 12 MICRONS

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We report infrared spectra over wavelength ranges from 2.5 to 5 microns and from 6 to 11.6 microns on a sample of 45 disk galaxies which all have their bolometric luminosities derived predominately from star formation and which cover a broad range of parameters such as optical morphological type, IRAS 60-to-100 micron color and IR-to-blue luminosity ratio. These spectra, taken in the spectroscopic mode of ISOPHOT on board the Infrared Space Observatory (ISO), should typify the total emission from the majority of galaxies with an interstellar medium. The mid-IR emission of the sample galaxies is strongly dominated by the emission features (EFs) at 6.3, 7.7, 8.6 and 11.3 microns, superposed on a low-level continuum. These features, together with the 12.7-micron feature that is outside our wavelength range, amount to 15% to 30% of the far-infrared luminosity. The relative strengths of individual features depend very weakly on galaxy parameters such as the far-infrared colors, strongly suggesting that the emitting particles are not in thermal equilibrium. The underlying continuum appears to follow a power law over the entire wavelength range observed. Fitting the flux density into a power law of frequency led to a sample distribution of the resulting exponential indices that has a median of -0.64 and an r.m.s. scatter of 0.5. This negative "slope" strongly favors a non-stellar origin of this continuum emission which could carry up to about half of the luminosity between 3 and 12 microns. We will also make statistical comparisons with other data and discuss some physical implications.

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